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**Labeling stem cells with fluorescent dyes for non-invasive detection with optical imaging.**

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**Funding Grants:** Labeling of human embryonic stem cells with iron oxide nanoparticles and fluorescent dyes for a non-invasive cell depiction with MR imaging and optical imaging

**Public Summary:**

**Scientific Abstract:**

Optical imaging (OI) is an easy, fast and inexpensive tool for in vivo monitoring of new stem cell based therapies. The technique is based on ex vivo labeling of stem cells with a fluorescent dye, subsequent intravenous injection of the labeled cells and visualization of their accumulation in specific target organs or pathologies. The presented technique demonstrates how we label human mesenchymal stem cells (hMSC) by simple incubation with the lipophilic fluorescent dye DiD (C<sub>67</sub>H<sub>103</sub>CIN<sub>2</sub>O<sub>3</sub>S) and how we label human embryonic stem cells (hESC) with the FDA approved fluorescent dye Indocyanine Green (ICG). The uptake mechanism is via adherence and diffusion of the lipophilic dye across the phospholipid cell membrane bilayer. The labeling efficiency is usually improved if the cells are incubated with the dye in serum-free media as opposed to incubation in serum-containing media. Furthermore, the addition of the transfection agent Protamine Sulfate significantly improves contrast agent uptake.

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